The III and IV Decades of American Hepaticæ have been recently received and among them the following are specially desirable: *Aneura latifrons*, *Pellia endiviæfolia*, *Radula spicata*, *Porella Bolanderi* and *Diplophyllum albicans*. The accompanying circular also announces that but one set remains of decades I and II. Prof. Underwood and Mr. Cook are to be congratulated on having supplied such desirable exsiccatæ. E. G. B.

Raspberry and Blackberry. In vol. xxxiv. No. 890 of "The Garden," C. H. Engleheart contributes a note in regard to a hybrid between the raspberry and blackberry, growing wild near Lynton, North Devon. The fruit is described as long, mulberry colored, and with a taste intermediate between that of the two parents.

Reviews of Foreign Literature.

At a recent meeting of the Botanical Society in Munich, Prof. Hartig gave the results of some experiments on the red beech, in reference to the influence of seed production on the increase in growth and the reserve material of the tree. According to these results, he believes the present accepted theory in regard to the use made by the tree of its reserve-stores is entirely incorrect. This theory, briefly stated, is as follows: A large part of the carbohydrates stored away as starch grains in the outer annual wood layers is used every year as material in forming the new leaves, stems, and annual wood and phloem rings. Prof. Hartig claims to have proven that in case of the red beech only a small portion of the yearly increase of the tree is due to the reserve material, but by far the larger part to the products of assimilation of the same year.

Certain experiments showed that the entire reserve material of carbohydrates in trees of fifty years of age was sufficient to furnish only about five per cent. of the yearly increase of the trees. Other experiments tried on trees of one hundred and one hundred and fifty years, just before a seed-bearing summer, proved them to contain twenty per cent. of the yearly increase. This was proven by taking off the whole number of branches so that during the entire summer not a single leaf was present to manufacture new carbohydrates, and so the tree was obliged to

use its reserve material for the annual ring. In the fall the trees were examined, and the above results as to increase in growth were obtained, also the fact, that while nearly every vestige of starch had been used up by the cambium layer, the amount of nitrogenous matter in the woody tissues was not less than that of normally growing trees.

Prof. Hartig suggests the following explanation of these facts: In normally acting trees, the cambium possesses only a slight power of dissolving and attracting to itself the reserve material within the tree, its need of nourishing matter being satisfied by the supply brought to it by the inner sieve tubes of the rind. When this supply is no longer furnished, as in case of the trees deprived of their smaller branches, the hungry cambium possesses a strong power of attraction, by which it is enabled to draw out the entire store of reserve material. Now, as it is quite evident the extra amount of reserve material is not designed for pathological purposes, it suggested itself to him that it was for the purpose of producing a large supply of seeds, and that the periodical recurrence of seed and not seed years was due to the respective amounts of reserve stores in the tree. A number of interesting experiments are given by which this assumption was fully corroborated. Our space does not allow the citation of these, but the reader is referred to the article itself, in the Botanisches Centralblatt, Vol. 36, No. 13, 1888. It must be mentioned, however, that in conclusion, Prof. Hartig admits the desirability of similar tests being applied to other trees before making the statement too general, yet he says it is not probable that the red beech would prove an exception as to its use of reserve material.

E. L. G.

Hymenoconidium petasatum is the name of a new and remarkable fungus, discovered by Hugo Zukal of Vienna, and described by him in a late number of the Botanische Zeitung.* Some olive branches with half-grown fruit had been sent him from Fiume, with the question as to the cause of the diseased condition of the tree from which the branches were taken. On the fruit appeared separate spots of a wrinkled, discolored appearance, and between

*January 25, 1889.

the wrinkles rose little projections no larger than a pin-head. The same were found on the leaves, more frequently on the under than the upper side. On examination, these were found to be little cushions of mycelium threads immediately under the epidermal layer. These threads were thin-walled, septate, and filled with minute oil drops; from this cushion extended little rhizoid projections into the spaces between the parenchyma of the host which sent haustoria into these cells. The protoplasm of these cells was contracted and discolored, and the cell showed other appearances of injury. In all respects the fungus and its effects on the host appeared like that of some of the family of the Uredineæ.

In order to discover what the further development might be, the end of the branch was fresh cut and placed in water under a bell jar. Not until after six weeks, and when certain portions of the olive fruit had decayed, was any change perceptible. Then the fungus began a further development, the mycelium threads lying next the epidermis sent up numerous little tubes parallel with each other and at right angles to the hyphæ branches, thus forming a sort of hymenial layer. These tubes, at first slender, afterward swelled out into oval shaped bodies. The epidermis was soon broken, leaving these exposed to the outside air. Soon after this stage, a cross wall formed in many of these tubes, cut off the swollen part, which after a short time developed into a pear-shaped spore, was provided with a roughened outer coat and finally separated itself from the rest of the plant. The remaining tubes appeared like ordinary paraphyses growing up thickly about the spores and projecting above them.

But the most remarkable part of the development is yet to come. Just after the hymenial layer originates and the spore tubes begin to assume their characteristic form, the whole mycelium cushion begins to undergo a rapid series of changes, by which it is transformed into a bundle of densely wound hyphæ. That portion of these directly under the central part of the hymenial layer send out branches downward which, growing rapidly at right angles to the surface, interweaving with each other and growing together, form the beginning of a stem whose growth is arrested at this stage, till the hymenial layer is well organized

and the spores started. Then the stem grows up rapidly to the height of from one to four centimeters, bearing with it at its summit the whole of the rest of the fungus, now developed into the hat or umbrella shape which marks so large a class of the Hymenomycetes. A number of glandular hairs have developed meanwhile on the under side of the hat, which secrete a fluid collecting about its base in a large clear drop.

The fungus is exceedingly sensitive to light, being positively heliotropic. The building of the stem sometimes fails, either partially or entirely, but even in the latter case the spores ripen quite normally. The hymenium then is very similar to the stylospore clusters of the Uredineæ.

Finally the author remarks that he has been unable, as yet, to bring the spores to germination. It is therefore impossible to say whether these may be considered the highest fruit-form of a distinct and independent fungus, or simply conidial forms whose farther development would result in some (yet unknown) higher form. He inclines to the first opinion and thinks the fungus is one of the Hymenomycetes of an extremely simple structure, whose basidia bearing tubes have not reached their full development.

E. L. G.

An article by G. Haberland, in Flora, on the chlorophyll bodies of the Selaginelleæ gives several new points in relation to these bodies, particularly in regard to their form and external appearance. In the assimilating cells of many species there is only a single chlorophyll body, described as tray or trough-shaped, (muldenforming) which corresponds perfectly with the chloroplastids of higher plants. Near the base of the leaf the cell contains one chlorophyll grain of a very irregular shape, or in some cases there are several quite unlike in form. In the parenchymatic cells of the rind of the stem were found numerous spindle-shaped chloroplastids which were bound to each other by fine, colorless protoplasmic threads so there was a continuous chain of these bodies in each cell. Some of these were changed into Leucoplastids, distinguished from the former by being smaller and colorless. In reference to the origin of the chlorophyll body, he says it occurs in the meristem of the apical region. Owing to the position of the chloroplastids with reference to the cell nucleus,

he draws the conclusion that the latter plays an important part in the formation of starch. E. L. G.

Beiträge zur Kenntniss der Cyperaceen. Heft I., Cyperaceæ novæ. O. Boeckeler, (pamphlet, pp. 53. Varel-an-der-Jade, 1888.)

Descriptions of 110 species of Cyperaceæ are given in this latest contribution by Herr Boeckeler. They are divided among the genera as follows: *Kyllingia* 1; *Cyperus* 24; *Heleocharis* 14; *Scirpus* 5; *Fuirena* 1; *Liphocarpha* 2; *Hypolytrum* 4; *Rhynchospora* 16; *Leptolepis*, a new genus, 1; *Cryptangium* 2; *Scleria* 11; *Homalostachys*, new genus, 1; *Trilepis* 1; *Kobresia* 3; *Carex* 24. None of them are North American, but several are from the West Indies, Colombia and Argentina.

Zur Kenntniss der Gattung Scirpus. Dr. Ed. Palla. (Engler's Bot. Jahrb., x., 293–301).

Herr Palla publishes the results of observations on the arrangement of fibro-vascular bundles in the stem of numerous species of genera in the tribe Scirpeæ, as affording characters for classification. As of interest to American botanists, a few of his conclusions may here be given. The genus *Dichostylis* of Beauvois is revived, and in it are placed certain species which have been described as *Cyperus*, *Scirpus* and *Fimbristylis*, including our *Cyperus Baldwinii*, *C. aristatus* and *Fimbristylis congesta*—rather diverse elements, we should say, *Trichophorum*, Pers., is brought into use for *Eriophorum alpinum* and *Scirpus cæspitosus*, *Scirpus*, L., is retained for *S. sylvaticus*, *S. atrovirens* and *Eriophorum cyperinum*, and the author thinks that *S. maritimus* and *S. fluviatilis* may also belong there; *Blysmus*, Panzer, is kept up as a genus. *Schœnoplectus*, Reich., includes *Scirpus Olneyi*, *S. Tatora*, *S. lacustris*, *S. pungens*, *S. mucronatus* and *S. supinus*. *Eleocharis*, R. Br., is accepted very much as we know it. *Isolepis*, R. Br., includes *Scirpus carinatus* and *Websteria fluitans*.

N. L. B.